

setting SR prohibit timer for a scheduling request procedure by the UE;

[fig. 10] Figure 10 is a flow diagram illustrating one implementation of a method 1000 for setting SR prohibit timer for a scheduling request procedure by the eNB;

[fig. 11] Figure 11 illustrates various components that may be utilized in a UE;

[fig. 12] Figure 12 illustrates various components that may be utilized in an eNB.

Description of Embodiments

[0010] DETAILED DESCRIPTION

A method for by a user equipment (UE) is described. The method includes receiving a RRC message including a first parameter related to a maximum number of scheduling request transmission for a secondary cell, performing a scheduling request procedure based on the first parameter, and transmitting a scheduling request on a Physical Uplink Control Channel (PUCCH) on the secondary cell. The RRC message further includes a second parameter related to a maximum number of scheduling request transmission for a primary cell and the scheduling request procedure is performed further based on the second parameter.

[0011] A method for by an evolved Node B (eNB) is described. The method includes transmitting a RRC message including a first parameter related to a maximum number of scheduling request transmission for a secondary cell, and receiving a scheduling request on a Physical Uplink Control Channel (PUCCH) on the secondary cell, wherein a scheduling request procedure is performed based on the first parameter. The RRC message further includes a second parameter related to a maximum number of scheduling request transmission for a primary cell and the scheduling request procedure is performed further based on the second parameter.

[0012] A user equipment (UE) is described. The UE includes a processing circuitry. The processing circuitry is configured and/or programmed to receive a RRC message including a first parameter related to a maximum number of scheduling request transmission for a secondary cell, perform a scheduling request procedure based on the first parameter, and transmit a scheduling request on a Physical Uplink Control Channel (PUCCH) on the secondary cell. The RRC message further includes a second parameter related to a maximum number of scheduling request transmission for a primary cell and the scheduling request procedure is performed further based on the second parameter.

[0013] An evolved Node B (eNB) is described. The eNB includes a processing circuitry is configured and/or programmed to transmit a RRC message including a first parameter related to a maximum number of scheduling request transmission for a secondary cell, and receive a scheduling request on a Physical Uplink Control Channel (PUCCH) on the secondary cell, wherein a scheduling request procedure is performed based on the

produce one or more demodulated signals 112. The one or more demodulated signals 112 may be provided to the decoder 108. The UE 102 may use the decoder 108 to decode signals. The decoder 108 may produce one or more decoded signals 106, 110. For example, a first UE-decoded signal 106 may comprise received pay load data, which may be stored in a data buffer 104. A second UE-decoded signal 110 may comprise overhead data and/or control data. For example, the second UE decoded signal 110 may provide data that may be used by the UE operations module 124 to perform one or more operations.

- [0062] As used herein, the term "module" may mean that a particular element or component may be implemented in hardware, software or a combination of hardware and software. However, it should be noted that any element denoted as a "module" herein may alternatively be implemented in hardware. For example, the UE operations module 124 may be implemented in hardware, software or a combination of both.
- [0063] In general, the UE operations module 124 may enable the UE 102 to communicate with the one or more eNBs 160. The UE operations module 124 may include one or more of a UE PUCCH resource control module 126, a UE scheduling request operation module 128, a UE Time Alignment operation Module 129, and a UE Activation/Deactivation Module 130. In some implementations, the UE operations module 124 may include physical (PHY) entities, Medium Access Control (MAC) entities, Radio Link Control (RLC) entities, packet data convergence protocol (PDCP) entities, and an Radio Resource Control (RRC) entity.
- [0064] The UE operations module 124 may provide the benefit of performing a scheduling request procedure efficiently. The UE PUCCH resource control module 126 may control PUCCH Groups and PUCCH resources and control parameters in PUCCH resource configuration. The UE scheduling request operation module 128 may perform a scheduling request procedure. The UE Time Alignment operation module 129 may perform a time alignment procedure including maintenance of uplink time alignment. The UE Activation/Deactivation module 130 may perform an Activation/Deactivation procedure.
- [0065] The UE operations module 124 may provide information 148 to the one or more receivers 120. For example, the UE operations module 124 may inform the receiver(s) 120 when or when not to receive transmissions based on the RRC message (e.g, broadcasted system information, RRC connection reconfiguration message), MAC control element (CE), and/or the DCI (Downlink Control Information).
- [0066] The UE operations module 124 may provide information 138 to the demodulator 114. For example, the UE operations module 124 may inform the demodulator 114 of a modulation pattern anticipated for transmissions from the eNB 160.
- [0067] The UE operations module 124 may provide information 136 to the decoder 108. For

SR periodicity for the PCell. In a case that the SR is configured for a SCell only, the SR period for determining a timer period may be a SR periodicity for the SCell. In a case that the SR is configured for a SCell and for a PCell, the SR period for determining a timer period may be a SR periodicity with shorter (or shortest) period between the PCell and the SCell(s). In other words, in a case that SR periodicity configured for the PCell is 8ms and SR periodicity configured for the SCell is 4ms, then 4ms (i.e. shorter) SR periodicity is used for determining the SR prohibit timer period. The UE 102 may set the SR prohibit timer based on the SR periodicity for the secondary cell and the SR periodicity for the primary cell. In another example, in a case that the SR is configured for a SCell and for a PCell, the SR period for determining a timer period may be a SR periodicity with longer (or longest) period between the PCell and the SCell(s). In yet another example, in a case that the SR is configured for a SCell and for a PCell, the SR period for determining a timer period may be a SR periodicity for the PCell. In yet another example, in a case that the SR is configured for a SCell and for a PCell, the SR period for determining a timer period may be a SR periodicity for the PCell. Setting SR prohibit timer based on the SCell SR periodicity may provide benefits of flexibility of configuration of SR prohibit timer and reduction of signaling overhead.

[0105] Figure 3 is a flow diagram illustrating one implementation of a method 300 for performing a scheduling request procedure by an eNB 160. The eNB 160 may transmit one or more RRC messages to the UE 102 to configure, for the UE 102, one or more of PUCCH Cell Groups, the PUCCH SCell, and SR. The RRC layer of the eNB 160 may assume or consider that the RRC layer of the UE 102 configures RRC layer and/or lower layers (e.g., PHY layer, MAC layer, RLC layer, PDCP layer) of the UE 102 according to RRC configurations which may be configured by the RRC messages, broadcasted system information, and so on. For example, the eNB 160 may 302 transmit a RRC message including a first parameter (e.g., dsr-TransMax) related to a maximum number of scheduling request transmission for a secondary cell. The eNB 160 may 304 receive a scheduling request on a Physical Uplink Control Channel (PUCCH) on the secondary cell, wherein a scheduling request procedure is performed based on the first parameter.

[0106] A sr-ProhibitTimer IE, the SchedulingRequestConfig IE, schedulingRequestConfigv1020 IE, PhysicalConfigDedicated IE, a PhysicalConfigDedicatedPSCell-r12 IE, physicalConfigDedicatedSCell-r10 IE, etc may be transmitted from the eNB 160 to the UE 102 by using a RRC connection reconfiguration message, a RRC connection reestablishment message, a RRC connection setup message, etc. eNB 160 may configure UE 102 with dsr-TransMax for the PUCCH SCell. Configuring dsr-TransMax for the PUCCH SCell independently of the PCell may provide benefits of flexibility of

parameter related to a SR periodicity (i.e., sr-ConfigIndex) for a secondary cell and a parameter related to a SR prohibit timer (i.e. sr-ProhibitTimer). The eNB 160 may 1004 assume or consider that the UE 102 sets the SR prohibit timer based on the SR periodicity for the secondary cell and may apply the SR prohibit timer. The srConfigIndex may specify a SR periodicity and a SR subframe offset. The sr-Prohibit Timer may be a timer used for SR procedure. The sr-Prohibit timer may be used to prohibit a SR transmission for a certain period. Value 0 means no timer for SR transmission on PUCCH is configured. Value 1 corresponds to one SR period, Value 2 corresponds to 2*SR periods and so on. In a case that the SR is configured for a PCell only, the SR period for determining a timer period may be a SR periodicity for the PCell. Setting SR prohibit timer based on the SCell SR periodicity may provide benefits of flexibility of configuration of SR prohibit timer and reduction of signaling overhead.

[0111] Figure 4a through 4d are diagrams illustrating examples for configuration of SR on a PUCCH on a PCell or an SCell. Figure 4a shows an example of a case that a PCell for a UE 102 is configured with the SchedulingRequestConfig IE. SR resources are shown in 401-407. The scheduling request is configured only for the PCell. SR periodicity is 4ms. Figure 4b shows an example of a case that a PCell for a UE 102 is configured with the SchedulingRequestConfig IE and an SCell (i.e. PUCCH SCell) for a UE 102 is also configured with SchedulingRequestConfig IE. The scheduling request is configured for the PCell and the SCell. SR resources for the SCell are shown in 411-417. SR resources for the SCell are shown in 421-424. SR periodicity for PCell is 8ms and for SCell is 4ms. The subframes for resources for the PCell and the SCell are not overlapped based on SR subframe offset. Figure 4c shows an example of a case that an SCell (i.e. PUCCH SCell) for a UE 102 is configured with the SchedulingRequestConfig IE. The scheduling request is configured for the PCell and the SCell. SR resources for the SCell are shown in 431-437. SR periodicity for SCell is 4ms. Figure 4d shows another example of a case that a PCell for a UE 102 is configured with the SchedulingRequestConfig IE and an SCell (i.e. PUCCH SCell) for a UE 102 is also configured with SchedulingRequestConfig IE. The scheduling request is configured for the PCell and the SCell. SR resources for the SCell are shown in 441-447. SR resources for the SCell are shown in 451-454. SR periodicity for PCell is 8ms and for SCell is 4ms. The subframes for resources for the PCell and the SCell are overlapped.

[0112] As shown Figure 4c, if the E-UTRAN (e.g, the eNB 160) configure SR subframe offset as SR resources among serving cells in any TTI (i.e. any subframe) are not overlapped, the PHY layer of the UE 102 may not need to handle selection among SR resources or power sharing among SR resources. In a case that the MAC entity of the UE 102 instructs the PHY layer to signal the SR on the PUCCH in a TTI, the PHY

Claims

- [Claim 1] A method by a user equipment UE (102; 1102), comprising:
 receiving a Radio Resource Control, RRC, message including a first parameter related to a maximum number of scheduling request transmissions for a secondary cell;
 in order to allow the UE to perform a scheduling request procedure;
 and
 transmitting a scheduling request on a Physical Uplink Control Channel, PUCCH, on the secondary cell, wherein the RRC message further includes a second parameter related to a maximum number of scheduling request transmissions for a primary cell and the scheduling request procedure is performed based on the first parameter or the second parameter.
- [Claim 2] A method by a base station (160; 1260), comprising:
 transmitting a Radio Resource Control, RRC, message including a first parameter related to a maximum number of scheduling request transmissions for a secondary cell, in order to allow a user equipment, UE, to perform a scheduling request procedure; and receiving a scheduling request on a Physical Uplink Control Channel, PUCCH, on the secondary cell, wherein the RRC message further includes a second parameter related to a maximum number of scheduling request transmissions for a primary cell and the scheduling request procedure is performed based on the first parameter or the second parameter.
- [Claim 3] A user equipment, UE (102; 1102), comprising:
 a processing unit (1181) configured to:
 receive a Radio Resource Control, RRC, message including a first parameter related to a maximum number of scheduling request transmissions for a secondary cell in order to allow the UE to perform a scheduling request procedure; and
 transmit a scheduling request on a Physical Uplink Control Channel (PUCCH) on the secondary cell, wherein the RRC message further includes a second parameter related to a maximum number of scheduling request transmissions for a primary cell and the scheduling request procedure is performed based on the first parameter or the second parameter.

[Claim 4]

A base station (160; 1260), comprising:
a processing unit (1281) configured to:
transmit a Radio Resource Control, RRC, message including a first parameter related to a maximum number of scheduling request transmissions for a secondary cell, in order to allow a user equipment, UE, to perform a scheduling request procedure; and
receive a scheduling request on a Physical Uplink Control Channel, PUCCH, on the secondary cell, wherein the RRC message further includes a second parameter related to a maximum number of scheduling request transmissions for a primary cell and the scheduling request procedure is performed based on the first parameter or the second parameter.